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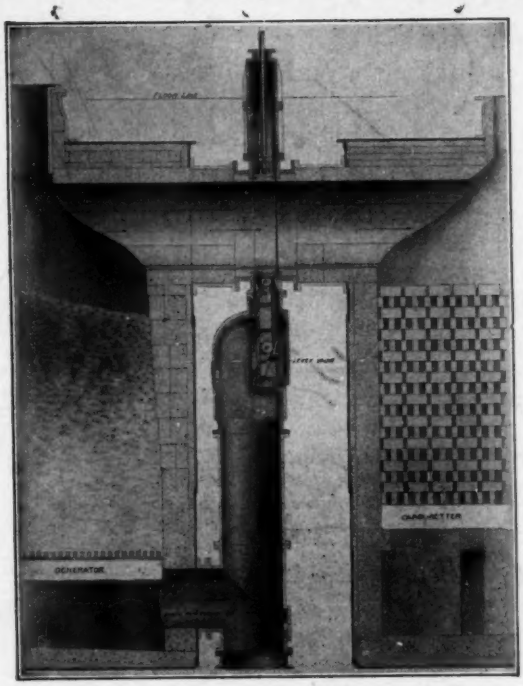

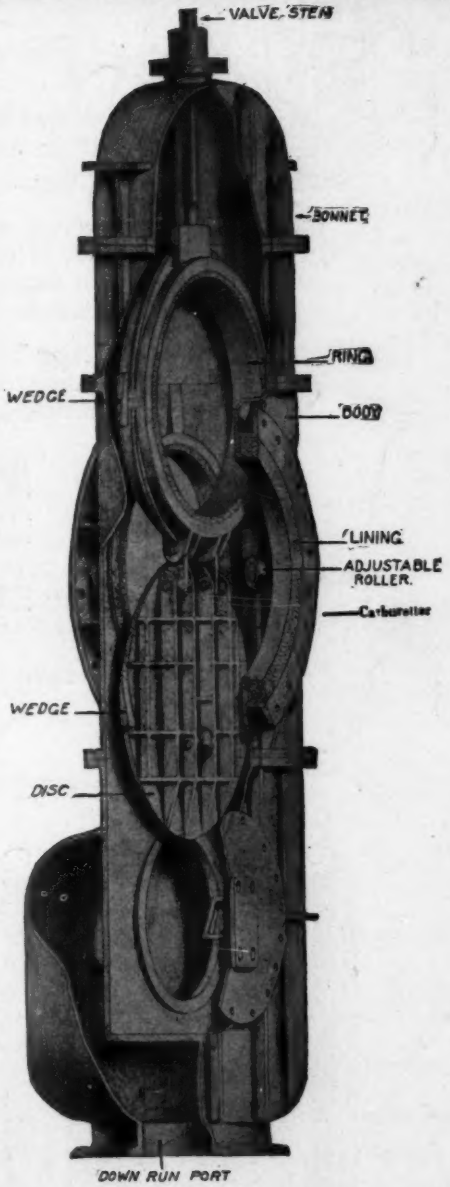

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AMERICAN
GAS JOURNAL

Vol. 121. No. 12 NEW YORK, SEPTEMBER 20, 1924 Whole No. 3482

Fuel of the Future. What Shall It Be?

XIII. Part 2. The industrial gases. Their properties and application

Ismar Ginsberg

A WORD must be said about that kind of gas that is known as blast furnace gas. It has but little importance to the industrial gas engineer, but it is a gaseous fuel which is employed on special occasions, both for power and heating purposes. It is the gas that is obtained from the blast furnace in which iron ore, in conjunction with coke and limestone, is converted into pig iron.

The analysis of this gas varies very considerably. Thus, the gas may contain from 8 to 16 per cent of carbon dioxide, from 23 to 33 per cent of carbon monoxide, from 1 to 3 per cent of hydrogen, a few tenths of a per cent of methane and from 55 to 60 per cent of nitrogen. The calorific power of the gas averages around 100 B.t.u. per cubic foot, sometimes falling as low as 80 B.t.u. per cubic foot.

The gas contains a great quantity of dust which has to be removed before it can be used as a power-producing medium in the internal combustion engines that operate the blast furnace blowing engines. It is also employed to pre-heat the blast air before it is introduced into the blast furnace.

The remaining gaseous fuels that will now be discussed belong to that class of gas which is manufactured in a central station for distribution throughout a community. The first of these to be considered is coke oven gas.

Coke Oven Gas

Coke oven gas is the gas that is obtained from by-product coke ovens which are employed for the manufacture of coke and the recovery of the by-products, such as tar, ammonia, etc., that are contained in the original coal. The gas that is obtained in this manner is distributed to the consumer, after about 50 per cent of it has been burned in heating the ovens in which the coal is distilled.

The gas that is produced in the by-product coke oven is of high quality and it has been suggested that it can be released for distribution among the consumers in even larger quantities by the use of a low-grade producer gas to heat the ovens in its place. There are various advantages that are claimed for coke oven gas in contradistinction to the gas that is manufactured in the retort and which is commonly known as coal gas.

The Properties of the Gas

It is said that the quality of the gas is as good as that of regular coal gas, but that the coke that is obtained in the process is of higher quality and commands a correspondingly higher price. Then, furthermore, as far as by-products are concerned, it is indicated that the yields of ammonia and benzol are better, and that the quality of the tar is superior. Other advantages of purely mechanical and general industrial character, such as greater efficiency, compactness of plant, etc., are also claimed.

The thermal value of the gas obtained will vary according to the proportion of benzol that is taken from it. Thus, a gas which is entirely deprived of its benzol content will have an average B.t.u. of 560 per cubic foot when properly selected coals are employed. When all the benzol is left in the gas, the B.t.u. content increases to 585 B.t.u. per cubic foot. It is, of course, possible to enrich the gas by adding to it the benzols that are removed from lean gas.

The gas is manufactured in various types of by-product ovens. These, it must be understood, may be run merely for the purpose of manufacturing the proper grade of coke demanded by the metallurgical industry, whereat gas is the real by-product, or else they may be used for the manufacture of gas, the coke being a by-product along with the others usually obtained in the gas works.

Yields Obtained in By-Product Coke Oven Gasification

It is interesting to note the yields of different products obtained by the gasification of coal in the by-product coke oven. Thus, when a mixture of 85

per cent high volatile coal and 15 per cent low volatile coal is employed, the following yields are obtained:

Products.	Yield per ton of coal.
Surplus gas, 560 B.t.u.	6,000 cubic feet
Tar (including naphthalene)	9.5 gallons
Ammonium sulphate	25 pounds
Benzols	4 gallons
Sodium cyanide	1.3 pounds

When 100 per cent of high volatile coal is employed the following yields are secured:

Products.	Yield per ton of coal.
Surplus gas, 575 B.t.u.	6,000 cubic feet
Tar	12 gallons
Ammonium sulphate	25 pounds
Pure benzol	2.3 gallons
Pure toluol	0.57 gallon
Crude light solvent	0.22 gallon
Crude heavy solvent	0.11 gallon

Composition of the Gas

The following tabulation shows the composition of some coke oven gases:

Description.	H	CH_4	CO	C_2H_4	C_6H_6	Heavy-hydrocarbons	CO_2	O_2	Remainder N_2
Solvey coke oven	56.9	22.6	8.7	..	..	3.00	3.00	..	5.8
Coke oven gas, average German, 1% water vapor	55.0	32.0	7.0	1.5	0.8	...	1.2	0.2	2.4
Good Solvay coke oven gas	48.0	35.5	5.1	4.2	1.2	...	1.3	0.5	4.2
Otto coke oven, poor part of gas	41.6	29.6	6.3	..	..	2.8	3.2	0.4	16.1

Coke oven gas varies in composition according to the coal used and the nature of the operations that are carried out in the coke oven, as well as the subsequent treatment that they receive in the purification process. The uses for coke oven gas in industry may be said to be just as diversive as those for coal gas that is manufactured in the retort.

Water Gas

Water gas is the gas that is manufactured by the action of a blast of steam on a bed of incandescent coal, coke or carbonaceous fuel. The first mention of this reaction is found as far back as 1780, when the Italian chemist, Felice Fontana, made this observation in his experiments. Donovan proposed the use of enriched water gas for illuminating purposes as early as 1830, but nothing practical came of the suggestion at that time. The alternate air and steam blowing process was originated by Gillard in 1849. It is also mentioned that the town of Narbonne, France, was lighted with water gas between 1856 and 1865. Mantles made of platinum wire were employed.

But it was not until 1873 that the real commercial history of water gas began, and in that year the first commercial-sized successful water gas plant was put into operation in the city of Phoenixville, Pa. Thereafter its development was rapid, many improvements being made in the process of its manufacture.

Principles of Operation

The principles on which the process depends are fairly simple in nature. The bed of coal is first heated with an air blast. The products of combustion during that period consist mainly of carbon monoxide and nitrogen. At the proper point of incandescence the air blast is discontinued and steam is blown through the incandescent mass of coal.

The steam reacts with the incandescent coal to give carbon monoxide and hydrogen in accordance with the following formula:

$$C + H_2O = CO + H_2.$$

This is an endothermic reaction, that is, it absorbs heat or requires heat for its performance. Hence, the temperature of the incandescent mass of coal is lowered, when such reaction takes place.

Properties and Composition of the Gas

The gas contains theoretically 50 per cent of hydrogen and 50 per cent of carbon monoxide. Under such conditions, the calorific value of the gas would be equal to 324 B.t.u. gross per cubic foot at a temperature of 60 degrees F. and atmospheric pressure. However, the composition of the gas varies, as will be seen from the following tabulation, which contains analyses of a number of water gases actually made and used on a large scale.

Thus it is evident that the actual water gas made does not conform very closely to the theoretical proportions of 50 per cent each of hydrogen and carbon monoxide. The heating value of the gas is also not as high as the theoretical, being around 300 B.t.u. net per cubic foot at 60 degrees F., on the average.

The Fuel

As has been indicated, the gas may be made from anthracite coal or coke, but recently another development has been attracting attention and that is, the use of special grades of bituminous coals as the water gas fuel. This is an important development, for it substitutes a cheaper fuel for a more expensive one and while there may be certain operating difficulties connected with the manufacture of gas from this fuel and while additional purification capacity may also be required, nevertheless, it now appears

(Continued on page 866)

*Doherty Three-Part Gas Rate

A short history of rate making and the workings of the three-part rate

D. E. Byerly

Adrian, Michigan

IN PRESENTING the subject assigned to me, it is necessary to review a few facts concerning the gas industry and the history of rate making.

Our plants, together with those of the electric industry, can hardly be classed as factories, for the making of gas or electricity; rather let us consider them as huge transforming stations, converting into a more useful form the latent energy stored up in coal, oil and water power, and distributing it to our clients or customers instantly in quantities they alone control.

If the gas plant simply manufactured the gas and sold it in containers, at so much per container, or per cubic foot, it would be far from fulfilling its job as a Public Utility and its product would not find a ready market, for our customers would not care to be bothered buying it in package lots. They want it delivered to them instantly, with the turn of a valve whenever they desire, and in the quantity necessary to perform the task they have for it.

What Is Sold to the Customer

Our customers are therefore buying energy plus the service of transforming and distributing that energy. Energy can be metered and sold on the basis of the meter registration, but the cost of rendering the service cannot be justly or equitably collected in such a manner.

An analysis of our cost sheets will show the bare cost of the energy sold is small compared to the cost of transforming the energy stored in the pile of coal and delivering it in the convenient gaseous form to our customers. Our revenues have been collected, however, on the basis of the energy delivered and not for service performed. As a consequence, the expansion of our industry has been materially retarded and direct discrimination is practiced against our most profitable customers.

The Flat Meter Rate

The flat meter rate is the oldest form of rate in use today in the gas business. In its use there is no inducement held out to the customer for better load factor without which the customer, to whom economy is not a large item, has placed unnecessary demands on the system, causing a much larger investment for the company than would have otherwise been necessary. He has increased the cost of service, not alone to himself, but to the other customers on the system, because the rate per cubic foot must be adjusted from time to time to collect the cost of doing business, which includes the interest, depreciation, taxes, etc., on the investment.

Example of Working of Flat Rate

As an illustration of the operation of the flat meter rate, let us consider two ordinary residence customers.

Number One has a use of 1,000 cubic feet per month.

Number Two has a use of 5,000 cubic feet per month.

If the rate charged these two customers is $1.60 per thousand cubic feet, their monthly bills are as follows:

Number One has a bill of $1.60.

Number Two has a bill of $8.00.

Now then, the bare cost of producing this gas would be, say, 50 or 60 cents per thousand. Assuming 60 cents per thousand, we find that Number One pays $1.60 less 60 cents, or $1, for service, and Number Two pays $8 less $3, or $5, for service. If these are both average residences, as they could easily be, and were using the same number and size of appliances, the cost of service would be the same to the company for each, and yet customer Number Two, who was using the service longer and helping flatten out your load curve, is paying just five times as much for this same service as customer Number One, who is a peak load user. Number Two is penalized for being a good customer. A study would probably show that neither customer was paying his proper share of the cost.

Block Rate

Next came the block rate. This rate recognizes quantity consumption only, regardless of the demands placed on the plant and distribution systems. Under this rate a customer having a demand of 100 cubic feet per hour and using the demand three hours a day would have a monthly consumption of 9,000 cubic feet. He would pay as much for his gas as one who had a demand of 300 cu. ft. per hour and only one hour a day use. The latter requiring three times the capacity in distribution, storage and meters, a much more expensive customer.

Demand Rate

The two-part, or so-called demand rate, used probably to a large extent in the electric rather than the gas industry, was established on the theory of charging the customer for service based on his demand on the system and plant plus a uniform price per thousand cubic feet. This rate automatically

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*Paper prepared for thirty-second annual meeting Michigan Gas Association, September 10 and 11, 1924, Detroit.

took care of the variations in the load factor from month to month for the same customer. The design of this rate is fairly simple.

If the average customer for whom this rate applies is using 2,500 cubic feet per month and it is necessary to collect $1.60 per thousand to pay the expenses of doing business, we could apply several two-charge rates to the consumers as a whole and get the same results. This is illustrated in Table No. 1.

Various methods of collecting the demand charge of this rate have been used, such as a block meter rate with very high price per thousand for the first few hundred feet with a minimum bill. With the minimum bill it is easy to see that the customer using no gas and the one using the amount allowed under the minimum are not paying their just portion of the cost of serving them.

Monthly Bills Under Various Rates

Monthly use cu. ft.	Straight meter rate $1.60 per M. cu. ft.	$1 fixed Charge plus $1.20 per M. cu. ft.	$1.50 fixed Charge plus $1.00 per M. cu. ft.	$2 fixed Charge plus 80c per M. cu. ft.
500	.80	1.60	2.00	2.40
1,000	1.60	2.20	2.50	2.80
1,500	2.40	2.80	3.00	3.20
2,000	3.20	3.40	3.50	3.60
2,500	4.00	4.00	4.00	4.00
3,000	4.80	4.60	4.50	4.40
3,500	5.60	5.20	5.00	4.80
4,000	6.40	5.80	5.50	5.20
5,000	8.00	7.00	6.50	6.00
6,000	9.60	8.20	7.50	6.80

(Table No. 1)

The Doherty Three-Part Rate

So far, I have attempted to review the several rates used in our business and bring out a few ideas regarding the industry we are in.

All of the rates above have objections in that they are discriminating as regards customers with no reward to the customer who is the most desirable so far as the cost of serving is concerned.

The keen competition and regulation early in the electric industry caused a close study of the items entering into their cost of doing business. In 1900 a paper was read before the convention of the National Electric Light Association at Chicago by Henry L. Doherty, who analyzed the cost of the electric company and suggested the three-part or Doherty rate, which has met all the arguments against the other forms of rates.

This rate recognizes three distinct classes of expenses, those proportional to the number of customers, those proportional to the customers' demand, and those proportional to the actual number of cubic feet produced, and carries three charges covering these three classes of expenses as follows:

Division of the Rate

Customers' Charge: This covers all expenses which increase proportionately to the number of customers attached and which has no relation to the maximum demand of the customers on their consumption.

Demand Charge: This covers all expenses such as investment in plant of sufficient capacity to carry the maximum load caused by the customers, but bearing no relation to the number of customers or their consumption.

Consumption Charge: This covers all expenses which vary with the output of the plant and which bear no relation to whether that consumption occurred in one hour or ten hours or to the number of customers to which it was delivered.

I will not attempt to go into detail in this paper regarding the classification of your expense accounts among the above groups, but will only give a general description of what comes under these groups and why.

The Customer Charge

The customer charge is calculated by taking the sum of all expenses proportional to the number of customers and dividing by the number of customers. For a given community this charge is the same for each customer, regardless of his size.

For instance, it takes as long to read a meter registering 1,000 cubic feet as to read one registering 50,000 cubic feet. Likewise, it takes as much work to enter it on the company's ledgers, to write the bill, deliver and collect it. The above is true whether the customer's meter registers zero or a large amount of gas.

The Demand Charge

The demand charge is calculated by taking the sum of the expenses incident to this cause and dividing by the total amount of demand which all customers placed on the plant and pro-rate it among the various customers in proportion to their demands. It is true that the investment in a plant is the same to supply 500 customers having 50 cubic foot demand as in a plant supplying one customer having 25,000 cubic foot demand. The fixed charges resulting should therefore be in proportion to the demand and not number of customers.

The Consumption Charge

The consumption charge is based on the sum of the expenses which vary with the amount of gas sold. It takes no more coal, oil or production labor to produce 1,000,000 cubic feet of gas distributed to 5,000 customers than to produce the same amount for one customer. This charge is based on the customer's consumption and is the only charge in proportion to the energy purchased.

(Continued on page 865)

GAS MERCHANDISING

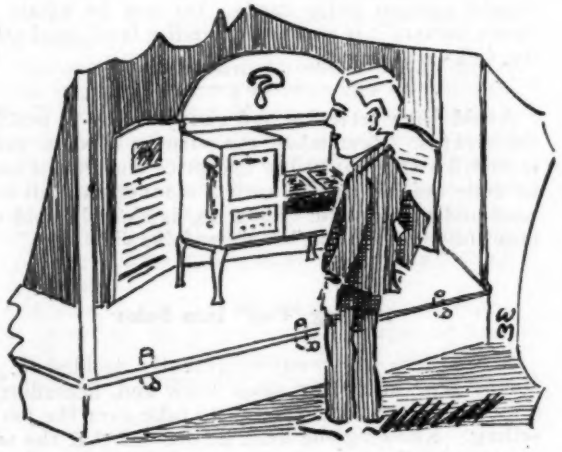
Domestic – Industrial

Here and There in Selling

Suggestions of timely interest

William H. Matlack

WITH "Jack Frost" coming, the merchandising manager of the gas company will again be flagging folks down that pass his store by attractive autumn window displays: Radiant gas heaters, glowers and gas steam radiators surrounded by pumpkins and shocks of corn and autumn leaves. Too, "Jack Frost" will be giving him a little trouble by frosting up his windows, unless he gets busy to devise ways and means to keep them clear of "frost" for foggy windows fail to flag folks.



Windows fog because they are improperly ventilated, and while there ar numerous ways of ventilating them, one of the simplest that we have heard of and one which any gas fitter can install is illustrated by the accompanying illustration, which is self-explanatory. Ventilation is provided for windows by the installation of a series of fresh air vents in the way of a couple of short nipples and an ell tied into a base and floor flange. Try them out and flag folks on frosty days.

Have You an Idea File?

The merchandise manager who wants to keep his store fresh and who wants to inject new ideas into his advertising, store and window displays should have one drawer in his desk or file cabinet set aside as an idea file, where he may store up articles from his favorite trade journal, articles that he clips from business papers, house organs and the daily newspapers that come to his desk.

The writer has a flock of scrap-books into which he pastes examples of good gas company advertising that strikes his fancy and, aside from this, he maintains a folder file and binders for articles from certain trade papers and business publications that he reads.

Anyone starting an idea file should, first of all, make a classification of the subjects that he is interested in and, having done this, make up file folders with headings of the subjects lettered on the flap. For instance, he may wish to file examples of advertising, sales letters, ideas for house publications, salesmen's compensations, window displays, and many others. It is very easy to collect reams and reams of ideas, but unless they are filed and properly indexed they are never to be found when there is need for them, and it is recommended that, if an idea file is to be maintained, it be built with due consideration of the fact that its big value is not in its size, but in its accessibility.

Appeal to the Senses

In exposing gas merchandise it is well to remember that there is a possible appeal to all five senses, and that all of them except hearing are automatically receptive to suggestion. Customer reaction in the majority of cases comes from seeing the merchandise. Therefore, keep your merchandise exposed, both in the store and the window. Hearing, too, plays a big part in the movement of merchandise from the dealer's store to the customer's home. Therefore, it is up to the salesman to tell them about it, especially the new merchandise. Smell, touch, taste and movement, as well as temperature, all play a part in the sale of gas appliances. For instance, many oven heat controlled ranges have been sold during home service demonstrations, due to the fact

that foods cooked at these demonstrations "smelled so good" or "tasted so good," and for the simple reason that "you do not have to watch your baking—the oven heat is just right—so hot and no hotter," as we heard one housewife say. These are just the obvious things; yet we maintain that it is the obvious things that sell the most merchandise.

They Want to See It

You old-timers who have "clumb" porches will bear us out in this, we believe. Nine times out of ten, or we might say ninety-five times out of one hundred, the women you call upon, and whose names have been turned over to you with the remark, "Here's a live prospect," want to see the range or water heater before she buys. "I'll come into the store when I am down town tomorrow," she says, and she usually does, though it may not always be tomorrow, and when she does come in to buy.

The obvious reason behind this is that she is just a human being and, being feminine, she wants to see and shop. Most women are of the visual type; they want to see the appliance first, and the merchandising manager who impresses this fact on the discouraged junior salesman will "pep" him up materially, provided it is so arranged that when the purchase is made in the office the salesman gets the credit.

House-to-House Calling a Hard Grind

House-to-house calling is a hard grind, but it is productive in a big measure if the above fact is taken into consideration. You who doubt this check it up for a week or a month or, better still, devise a way to show the merchandise in the home. As we view it, the time will come—and it is not far distant—when the gas range and other gas appliance will be demonstrated from specially built trucks provided with gas in tanks that will enable an actual demonstration to be given at any prospect's home and that the range or other appliance will be so connected that it may be quickly disconnected and delivered to the customer who "wanted it yesterday," but who would not buy it until he saw it.

A Few Pertinent Suggestions

Display slow moving merchandise on the right-hand side of your store. Eighty-five per cent of the customers entering your store walk on the right-hand side.

——:o:——

Be sure to arrange your window display so that all merchandise faces the front of the window. Keep this in mind as well when the window has two display fronts.

——:o:——

Remember that, notwithstanding what you may have heard about the value of show windows, they are not worth a lead nickel unless they are tastefully decorated. The window without a display of merchandise is of no value when it is considered from the right angle, the sale of merchandise.

——:o:——

Some gas companies are increasing range sales by displaying and selling related merchandise that does not consume gas. One company sells oven thermometers in connection with ranges and space heaters, while another merchandise manager told us the other day that he was going to put in a line of curling irons and marcel wavers in order to increase the sale of gas heaters for these purposes.

——:o:——

A Southern gas company has adopted a policy of having special one-day sales on Mondays and Fridays that do not fall around final discount day.

——:o:——

A Western commercial manager has waged a campaign to sell all employees of his department an automatic water heater. He agrees with us that if a man does not use the appliance he is trying to sell and that if he is not SOLD on the service it renders it is a pretty hard job for him to tell a prospective customer about the appliance. It follows that the gas man should take his own medicine.

——:o:——

Price cards do a lot of silent selling. All appliances displayed, either on the floor or in the window, should contain price cards. Do not be afraid of "price cutters"; if your merchandise is of good quality, folks will buy it.

——:o:——

Avoid fancy lettering and gaudy scrolls in making show cards. Remember, the purpose of show cards is to tell a story of utility and price and that it must be done quickly and in such a manner that all may read and understand. Show cards should avoid the idea of being "artistic," as some folks view "art."

Putting "Pep" Into Sales

A Southern gas company recently decided to put some "pep" into their sales work and, accordingly, a merchandiser was called in to take over the job of selling. Knowing the field, he decided that the way to attract folks was to make a very reasonable down-payment and spread the balance of the payments over a long period of time. Permission was granted and he opened up his campaign in the Sunday newspapers. This was in August, when "folks won't buy now; it's too hot." But he went at it just the same, even in the face of records that indicated that sales during the hot months for the past ten years had been very low. But the first three days of the sale showed more sales as for number and value in dollars and cents than had ever before been made in the same period by the company. The thought in bringing this up is that if you get the idea that selling will sell implanted in your mind—plan your work and work your plan and you will bring in the orders—that is, if you will spend money for printer's ink.

INDUSTRIAL GAS LESSONS

IF IT'S DONE WITH HEAT — YOU CAN DO IT BETTER WITH GAS

Lesson No. 38

Expansion Effect of Heat (continued)

Examples on Change in Volume Due to Pressure

The fundamental rule to remember in calculating the change in volume that takes place when the pressure changes is that as the pressure increases the volume decreases; as the pressure decreases the volume increases. In other words, the original volume will be multiplied by a fraction, the numerator of which is greater than the denominator, giving a greater volume than before, when the pressure decreases, that is, when the final pressure is less than the initial pressure. On the other hand, the original volume will be multiplied by a fraction in which the numerator is less than the nominator when the final pressure is greater than the original pressure, resulting naturally in a final volume that is less than the original volume.

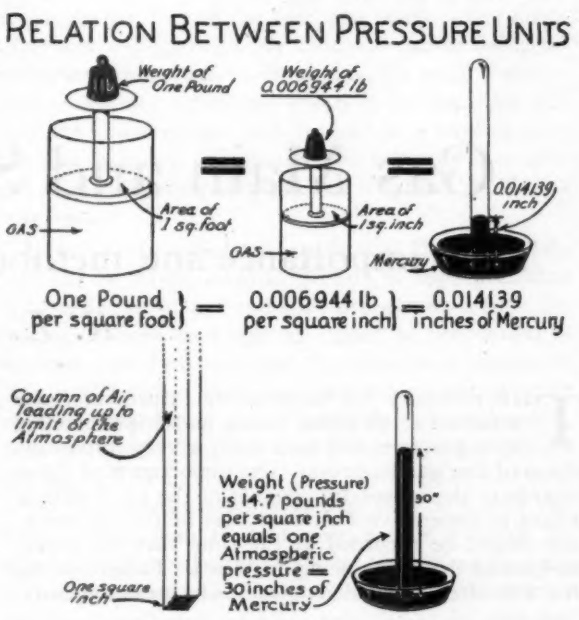
For example, if the original volume of coal gas is 100 cubic feet at a pressure of 32 inches of mercury, what will be the volume of the gas at atmospheric pressure? Atmospheric pressure is commonly taken to be 30 inches of mercury, although it varies considerably, not only from day to day, but from hour to hour. Therefore, in order to obtain absolutely accurate results, it is always advisable to note the exact pressure of the atmosphere by making a barometric reading.

The volume of the gas, 100 cubic feet, must therefore be larger at the pressure of 30 inches of mercury than at that of 32 inches. Hence the following calculation will give the new volume of the gas:

$$100 \times \frac{32}{30}, \text{ or } 106.6 \text{ cubic feet.}$$

The Units of Pressure

It must be reckoned here that there are several units that may be employed in the measurement of pressure. For example, pressure may be measured in inches or millimeters of mercury, in pounds per square inch or kilograms per square centimeters, inches or feet of water, etc. It will be necessary, therefore, to know the relation between the various units, so that one may be converted into the other without any diffifficulty. This relation applies not only to the units of the metric system with those of the English system, but also to the relation between the units of the English system themselves, for these may be expressed in various ways.


RELATION BETWEEN PRESSURE UNITS
Weight of One Pound
Weight of 0.006944 lb
0.014139 inch
Area of 1 sq. foot
Area of 1 sq. inch
GAS
GAS
Mercury
One Pound per square foot
=
0.006944 lb per square inch
=
0.014139 inches of Mercury
Column of Air leading up to limit of the Atmosphere
Weight (Pressure) is 14.7 pounds per square inch equals one Atmospheric pressure = 30 inches of Mercury
30"
One square inch

Relation of Units of Pressure

The following tabulation gives the relation between all the common units that are employed in measuring and recording pressure:

Another unit that is often used is one atmosphere which is equal to 1.0335 kilograms per square centimeter. Similarly, one pound per square inch is equal to 2.309 feet of water at a temperature of 62 degrees F. and 27.71 inches of water at the same temperature.

One ounce per square inch has the following equivalent:

0.1276 inches of mercury at 62 degrees F.
1.732 inches of water at 62 degrees F.

One atmosphere pressure, 14.7 pounds per square inches, also has the following equivalents: 33.847 feet of water at 62 degrees F.
760 millimeters of mercury at 32 degrees F.

	lbs. sq. ft.	lbs. sq. in.	Inches of mercury at 32 deg. F.	Atmospheres at sea level
One pound per square foot	1	0.006944	0.014139	0.0004724
One pound per square inch	144	1	2.03594	0.0682
One ounce per square inch	9	0.0625	0.127246	0.004252
One atmosphere, standard at sea level	2116.1	14.696	29.924	1
One kilogram per square meter	20.4817	0.142234	0.289579	0.009678
One gram per square millimeter	204.817	1.42234	2.89579	0.09678
One kilogram per square centimeter	2048.17	14.2234	28.9579	0.9678
Fluid Pressures—				
One foot of water at 39.1 deg. F., maximum density	62.425	0.43350	0.832254	0.029492
One foot of water at 62 deg. F	62.355	0.43302	0.88080	0.029460
One inch of water at 62 deg. F	5.196	0.036085	0.07340	0.002455
One inch of mercury at 32 deg. F. standard	70.7290	0.491174	1	0.033416
One centimeter of mercury at 32 deg. F. standard	27.8461	0.193376	0.393701	0.013158
One foot of air at 32 deg. F., one atmosphere pressure	0.08071	0.0005604	0.0011412	0.00003813
One foot of air at 62 deg. F	0.07607	0.00052582	0.0010755	0.00003594

Gas Main and Service Records

Their importance and methods used in making the records

R. E. Pierce

THE necessity for keeping for future reference a record of all pipes, valves and drips installed by a gas company is in itself a very important phase of the gas business. The importance of these records to the successful conduct of the gas business makes it imperative that every bit of this information should be recorded at the time that the pipes, valves and drips are being installed. Failure to do this will often cause discrepancies in measurements.

The early gas man gave very little thought to records and this has been the cause of many wasted dollars, in time lost, costly street repairs, gas lost and interrupted service. Modern business methods, aiming more and more to pave the way for the man who is to follow, have so changed conditions that today nearly every gas company has some system of recording mains, services, drips and valves.

The Nature of Measurements Recorded

When a piece of main is laid, measurements showing the line on which it is to run, its depth below the surface of the street, the location and description of all fittings must be made and recorded. Measurements from the property line are preferable to those taken from the line of pavement. It is necessary when taking measurements that all objects are clearly indicated on the plan and that these objects are of a permanent nature. House foundations, hydrants, sewer manholes and stone bounds are excellent objects to take measurements from, because they are seldom moved. The location of bells is valuable when the work of barring for leaks is undertaken, especially where the mains are laid under paved streets. The grade of the gas main should also be recorded.

Records of Services

Records of services are as important as main records. A plan should be drawn of every service. This plan should give detailed information as to the location and size of tap in main, size pipe, distance from main to property line; from property line to wall of building and length of pipe run inside of wall; also the grade of the pipe should be shown.

The same method used on service pipes is especially applicable to drips and valves. Like the old adage, "A stitch in time saves nine," the value of these records is clearly shown when trouble arises.

As The Journal Views It

SERVICE WITH INDUSTRIAL GAS

In a recent issue of the American Gas Journal there was published an article dealing with the importance of giving service with industrial gas. Those gas men who are concerned with the sale of gas for domestic consumption, as well as of appliances wherein gas is used know that it is a very important function of the gas company to give service and take care of the gas-using apparatus that it sells and installs. They know that after a sale is made it is necessary for the service department quickly to arrange for installing the apparatus, regulating it, and making it work to the satisfaction of the customer. Furthermore, after the gas appliance has been in use for some time and it gets out of order, it is then again the function of the service department to see that it is put back again into working order and that the customer remains satisfied.

Now that we have industrial gas business, and now that the gas company is selling not only the fuel for industrial use, but also the appliances in which the gas is used, the same condition has arisen. It is just as essential, if not even more so, to see that the gas consuming apparatus is properly installed in the factory, that it works the way it should, and that the operators who use it understand it and get the proper results out of it. Furthermore, it is necessary that the apparatus be kept in good condition, and that the gas company should be in a position always to anticipate trouble with gas apparatus, rather than to be called upon to remedy a defect after it occurs. This means, therefore, constant inspection of the apparatus, which is essential if the gas company is to give real service to its industrial customer.

This is a very important part of the industrial gas business. It calls for the attention of men who can give to this part of the work the utmost that is in them. It calls for expenditures on the part of the gas company which may perhaps seem large, or unjustified at first glance, but which will more than prove to be worth while in the long run. It must be remembered that if anything happens to a furnace in which gas is used in a manufacturing organization, blame will immediately be placed, not upon the appliance, but on the fuel, gas, itself. The manufacturer will immediately condemn gas as being no good, and there will be created in his mind a prejudice which may ultimately result in his abandonment of further use of gas and the loss of a customer to the gas company, unless steps are taken by it to render efficient service with the industrial gas appliances it installs.

It must be pointed out again that the way to do this lies in the constant inspection of apparatus that is installed in plants and that use gas as a fuel. It has often been said that an ounce of prevention is worth a pound of cure, and this more than applies to this case, because of the peculiar circumstances that surround the use of gas in industrial establishments. It is far better to spend time and energy in inspecting appliances to see that they are in good working order and to adjust them so that they will give the best results, than to wait until a kick is made by an irate industrial user, who, because of negligence of his own, or of his workers, has had trouble with the gas installation, and has unhesitatingly sent gas to perdition without due consideration of the facts.

Therefore, the gas company is called upon to give service to industrial gas in the same manner, and, in fact, in a more elaborate manner, than it has been doing in the case of domestic business. And if it does, it surely will have no regrets and by extending this service to include the entire industrial field in its district, it will be able to materially increase its industrial business. It will be able to render service when called upon. It will be prepared for any contingencies that may arise. And when the manager of a plant has the occasion at any time to ask: "What can you do for me in the way of gas service?" it will be able to tell him exactly and fully what is to be done and what can be done. It will then unquestionably be able to sell gas as an industrial fuel.

The Sale of Coke

A discussion from the standpoint of the smaller properties

F. E. Caton

Albion, Michigan

IN PRESENTING this paper, it is not my intention to try to tell you how to sell your coke, but rather tell you how we have been successful in disposing of ours. You may get an idea from this paper, and you may not, but if I am successful in putting across one single idea I will feel well repaid for this effort.

As the heading of this paper indicates, I am going to discuss coke sales from the standpoint of the small plant. We wonder, sometimes, why it is necessary to put forth so much effort to sell coke, when we know it is better and cleaner than all grades of soft coal. If the public knew as much about coke as we do, this would not be necessary; however, they do not, and it is therefore necessary for us to educate them to this fact.

I have no theories to offer. All I know about selling coke is what I have learned from having been connected with the coke department of our company for some seven or eight years in the past, and I trust you will pardon some personal references to bring out my points.

Analyzing Prospects Before a Campaign

Before starting a campaign for the sale of any kind of merchandise, I think it is well to first analyze your prospects, in other words, find out as near as possible who your prospects are, and in this connection I am going to suggest just a few places where coke can always be sold:

Dwellings, bakeries, Chinese laundries, hotels, restaurants, apartment houses, public schools, postoffice buildings, down-town office buildings.

The Public School Field

In fact, coke can be sold any place where they use a low pressure boiler for heating purposes. It is my opinion that too much effort is directed to the heating of dwellings and not enough to the fellow who uses large quantities of fuel. One large office building is worth thirty or forty residences. Some will tell you that this can't be done in their town, as conditions are different. I don't believe in those kind of arguments, and my reason for not believing them is this: I have sold coke in the East, West, North and South, and have found conditions almost the same. For instance: I have always been able to contract with the public schools for all or a portion of their heating, in every place wherever I have sold coke. The public school board should be approached with the arguments of cleanliness. This is easy business, but before you try to land any of this class of business it is necessary to first convert the local fireman. If you will thoroughly convert the fireman, you can almost leave it up to him to sell to his employer.

Selling Coke to Uncle Sam

I wonder how many of you have had nerve enough to try to sell Uncle Sam for his postoffice building in your particular town. I called on Uncle Sam once and asked him for an order for his postoffice at our town, and he told me that he never bought any kind of fuel without first making an evaporation test in comparison to the kind of fuel that he was now using. I hadn't ever pulled off any evaporation test on any kind of fuel, but I had heard of such things, so I told him that I would be glad to run this test for him. After reading up on the subject for a few nights, I finally made the test, the results of which were sent to Washington, D. C., and in a few weeks we received their order for the following winter's supply of fuel. It takes a lot of nerve sometimes to get into some of these places, but once you get them started, it will surprise you how easy this business is to secure. From the results of the above test we received orders from over half of the large office buildings down town that year. Fortunately we had a very large pile of coke in the yard or we never could have supplied the demand.

Coke for Apartment Houses

Apartment houses use a lot of fuel, and usually they can be sold some coke to mix with their regular fuel. The writer sold coke in Salt Lake City, Utah, one winter, and was successful in signing up thirty-six apartment houses. Of course, to get this kind of business, it is necessary to do a lot of demonstrating. In every instance it will be a case of educating the local fireman in the proper use of coke, and it will also be necessary to go back occasionally to see that he don't forget all that you showed him.

Sell Coke Through Local Dealers

I think probably we all have our own pet ideas just how coke should be sold, and I am no different

(Continued on page 869)

*Paper prepared for thirty-second annual meeting, Michigan Gas Association, September 10 and 11, 1924, Detroit.

Catechism of Central Station Gas Engineering in the United States

Installment No. 38

(Continued from last week)

Ans. In making a lead joint in a 6 in. cast-iron main, the first step in the operation, after the spigot end of one length has been inserted in the bell of the other and the length driven home, lined up and fixed in place by the tamping of a little dirt around the middle of it, is to fill solidly with packing, a portion of the joint space between the spigot and the bell, the amount of space so filled being determined by the depth of lead which it is desired to have. For ordinary straight work with 6 in. pipe, the depth of lead may be taken at 1½ in., and the joint space will therefore be filled with packing to a point 1½ in. back from the face of the bell.

Jute packing, either plain or tarred, is usually employed. Packing which has been allowed to absorb a small quantity of tar can be driven tighter than plain packing, but tar being cheaper than jute it is hard to avoid the presence of too much tar in tarred packing, and for this reason plain packing is often given the preference.

The Packing

A sufficient number of strands of packing should be twisted to form a rope of a diameter a trifle larger than the width of the joint space, and this should be cut into pieces of such length that the ends will come into close contact when a piece is placed around the outside of the spigot end of the pipe and pulled up tight. One of these pieces is used to lift the spigot end as it is inserted into the bell of the pipe previously laid, and is sent home with it, thus keeping the spigot central in the bell and avoiding the necessity of wedging it up after it is in place. This piece of packing is driven solidly into place in the bottom of the joint space by means of a caulking hammer and packing iron, and other pieces are inserted one at a time, the joint in each ring being put, say, one-fourth of the circumference away from the joint in the preceding ring, and each driven home, a sufficient number being used to fill the joint space to the required depth, leaving 1½ in. for the lead. The packing must be driven hard and the finished layer must be of uniform depth, so that the lead space will be uniform all around the pipe.

Fixing the Spigot End of the Pipe

A clay roll or other form of joint runner is then placed around the spigot end of the pipe, being brought tight against the face of the bell, and so set as to leave a triangular space, having its base on the pipe and its apex on the face of the bell slightly above the inside edge, which the lead can fill and thus make it certain that, when driven, the joint will be of the shape shown on the cut. Molten lead is run into the joint and this space until both are completely filled and the lead stands above the highest point on the inside edge of the bell, the lead being poured in through an opening or "gate" left on top of the pipe. When the lead has hardened the joint runner is removed and the "gate" or lump of lead left where the opening for pouring was made is cut off. The lead is then chiseled all around the pipe with a cold chisel and caulking hammer. This separates the lead from the surface of the pipe and makes a groove in which the first caulking tool, the face of which is about 3/16 in. thick, can fit. The lead is driven all around with this tool and then with tools successively increasing in thickness by about ⅛ in. until the full width of the joint has been reached. The work with each tool should be begun at the bottom of the pipe and carried around each way, finishing up at the top. The thickness of the last tool used should not be greater than the width of the joint, and the driving with this tool should cut the lead off sharp with the insde edge of the bell, otherwise there is danger that the force of the blows will be expended against the face of the bell instead of doing the full amount of work that it should do in compressing the lead in the joint. In order to have the tools fit the joints exactly it is well to have them made in sizes varying in thickness by 1/16 in., though it is only necessary to use on any joint tools varying by ⅛ in., the proper sizes being selected. The position in which the tools are naturally held when caulking the joint will give it the finished shape shown on the cut, if the joint runner has been put on properly and sufficient lead used.

There will be required for making a 6 in. lead joint about 7 to 8 lbs. of lead, and 7 to 10 oz. of jute packing. A good workman should be able to average nearly three joints an hour for a day's work.

The cut shows the spigot and bell of the standard dimensions adopted by the American Gas Light Association in 1905..

The Cement Joint

06. Describe the making of a cement joint in 8-inch cast iron hub and spigot pipe, giving approximately the quantity of materials used and the time it would take a man to make the joint. Give a sketch showing a section of the joint with dimensions.

Ans. Use Portland cement. Natural cements are not uniform in quality, and, as a rule, are too quick-setting to permit of their use with safety. In selecting a brand, take a relatively quick-setting Portland. If the cement sets too slowly there is danger of the finished joint being disturbed before setting.

Use the cement neat—no sand.

Use the cement as dry as possible, so that it requires hammering the yarn against it in order to bring the moisture to the surface. When sufficient water is added the cement will still appear crumbly in the pan, and will just retain the impression of the fingers when squeezed in the hand.

Care in Using the Cement

The cement should be used immediately after mixing; if it lies unused over five minutes it should be discarded. The cement remaining in the pan should be entirely removed before mixing up any new cement. In mixing cement, first determine the quantity required for one joint, and the quantity of water required for this cement, and then always use the cement and water by measurement.

Use jute yarn, untarred. When the joint is made the yarn and sides of joint may be moist or damp, but should not be wet.

Great care should be taken to have the surface of the bell and spigot making up the joint as clean as possible. If there is any appreciable rust it should be scraped off with a wire brush, and, if necessary, gasoline should be applied to cut out the rust still further, this being done at least a day before the joint is to be made in order to give the gasoline time to evaporate.

Description of the Finished Joint

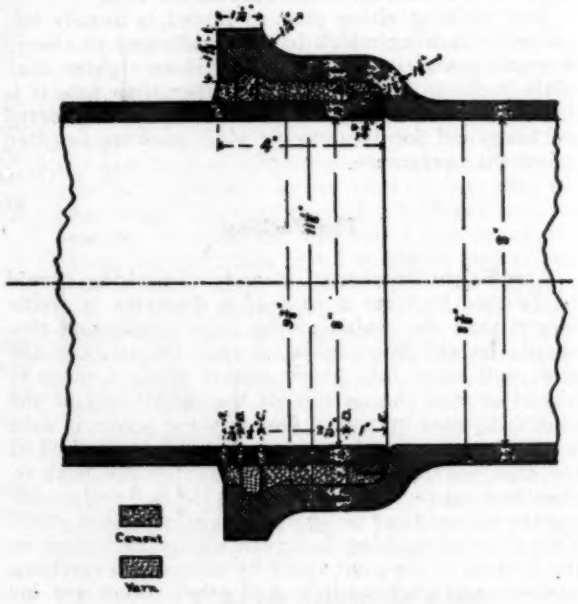
The finished joint should consist of one roll of yarn of the exact circumference of the pipe, twisted and driven tightly to the bottom of the bell, occupying approximately the sace D-E; then a solid mass of cement extending to a point about 1 in. back of the face of the bell, occupying the space C-D; then a second roll of yarn occupying the space B-C; then a facing of cement, occupying the space A-B. Do not make a large fillet extending to the outside diameter of the bell. In making the joint after the yarn D-E has been driven in tightly, the cement should be shoved in with the hands, on which are rubber gloves or mitts, preferably the latter, until the whole space A-D is filled as tightly as it is possible to do so with the hands, being particular to fill the space completely. A wooden pusher, shaped something like a yarning tool, is useful for pushing back the cement after it has been put in with the hands. Sometimes a roll of yarn is used to drive the cement back, the yarn being withdrawn, more cement entered, and the process repeated until the desired quantity has been entered. The second roll of yarn, B-C, is then put in and driven back by means of a tool similar to a yarning tool, but with a blunter edge, until it is not possible to drive it back any more, which condition is generally obtained when it has reached the position B-C as shown in the figure. The space A-B is then filled with cement. The hard driving of the yarn B-C is very important as being necessary to so compact the cement C-D that there will be no chance for gas to get either through it or between it and the iron.

After the first yarn is in, and before the joint is made, the pipe should be thoroughly bedded and tamped in between the bell holes to prevent any movement of the joint after it is made.

Protecting the Finished Joint

When the joint is made, it should be protected from the sun. As few joints as possible should be made in the rain. If work is done on a hot day, and the pipe has been exposed to the sun so that it has become quite heated, it is advisable to cool it off by application of water to the insfide, of the bell and the outside of the spigot, care being exercised not to have any water left in the bottom of the joint, the effect of which will be to make the cement too wet.

All joints should be tested before being covered up. The best test is made by connecting gas pressure to the new pipe, through a meter, thus measuring the amount of leakage, if any. If the meter



The Cement Joint

indicates leakage, the leaks should be found by using soapsuds on the joints. Fire should never be used. The joints should be tested only after the cement has set sufficiently to prevent its being hurt by the soapsuds; where feasible, this should be done on the following day.

To make each joint there will be required on an average 5 ounces of yarn and 1¼ quarts of cement, and the time required will be 15 minutes for one man. This time is the average time that would be taken per joint over a whole day's work.

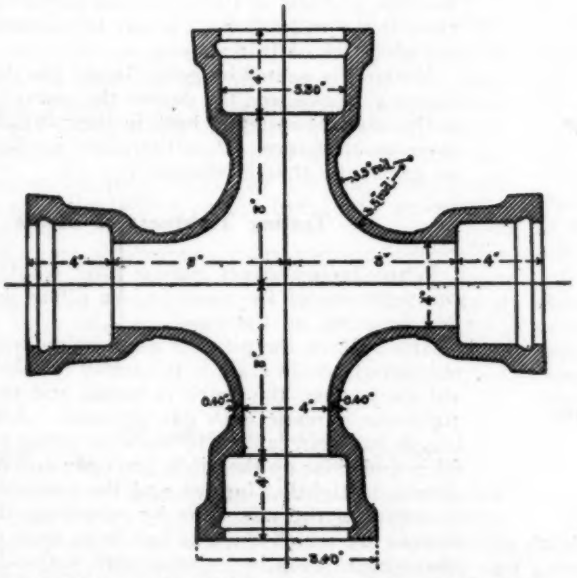
Cement joints are also made in a similar manner to the joint described, but with the use of less cement

and more yarn. While it is possible to obtain tight joints in this way, it is not thought that the joints obtained are as good as those made by the method described above.

The Cross, or Four-Way Branch

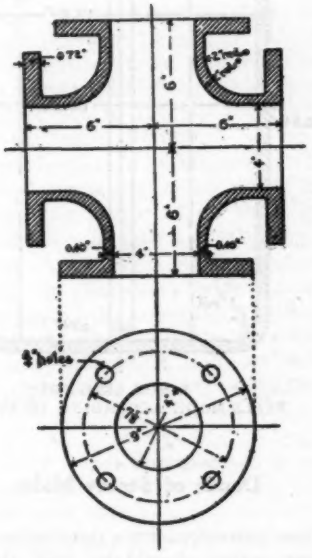
207. Give a description, illustrated with sketches, of a cross, or four-way branch, for four-inch cast-iron pipe, giving the dimensions to be used when it is provided with bells, and also those to be used for flanged ends, including the number of bolts and diameter of bolt circle.

Ans. A four-inch cross or four-way branch made according to the standard is shown on the accompanying cut. The bell cross has a bell on each outlet unless otherwise specified, although any desired combination of bell and spigot ends can be made. The distance from the center line of each run to the bottom of the bells on the other run is 8 in. The depth of the bells is 4 in., and the other dimensions are as shown on the cut.



Four-Inch Cross with Four Standard Four-Inch Bells

For a flanged cross the distance from the center line of the runs to the faces of the flanges is 6 in. in each case. The outside diameter of the flanges is 9 in., the diameter of the bolt circle is 7⅛ in., and the flanges are drilled with four ¾ in. holes placed as shown.



Four-Inch Flanged Cross

Drip and Cover and Pumping Line

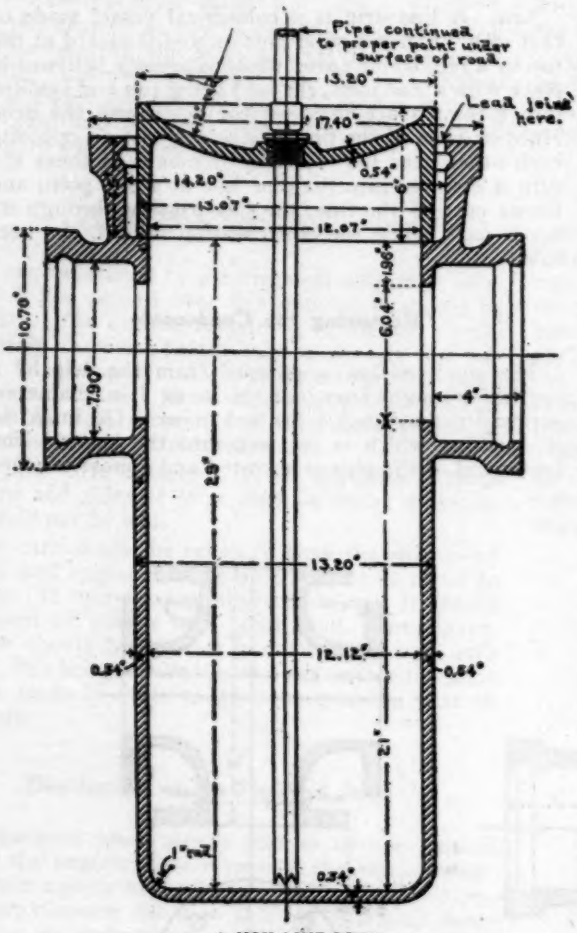
208. Give a description, illustrated with a sketch, showing all the dimensions of drip and cover and the arrangements of the pumping line, of a 6-inch line drip.

Ans. A line drip is a cylindrical vessel made of cast iron. It has a solid bottom and is closed at the top by a removable cover which is usually fastened in place with a lead joint, the lead being run and caulked into a joint space between the cover and the drip. Hubs or bells of the proper size are cast on opposite each other near the top, and by means of these the drip is inserted into the pipe line at a low point and forms part of the line, the gas passing through its upper part, while the condensation falls to the bottom.

Removing the Condensate

The condensation is pumped from the drip by a vertical wrought iron pipe, ¾ in. or 1 in. diameter, screwed through a 1¼ in. × 1 in. or a 1¼ in. × ¾ in. bushing which is screwed into the cover. The lower end of the pipe is serrated and almost touches the bottom of the drip, and there is screwed on the end projecting above the cover another piece of such a length that the upper end is just below the level of the roadway, in which is set a drip-box which protects the pipe and at the same time renders it accessible. When the drip is to be pumped, the cap, by which the upper end is closed, is removed, and the drip pump screwed on. Sometimes the pumping pipe instead of being carried up vertically to the surface is run under the surface to the curb and then brought to the top.

The cut shows a section of a 6-inch drip made according to the standards adopted by the American Gas Light Association in 1905.



6-INCH LINE DRIP
BELLS MADE ACCORDING TO STANDARD.

Depth of Street Mains

209. What considerations determine the depth at which street mains should be laid, there being no question of interference with any other pipe systems?

Ans. The principal considerations that determine the depth at which street mains should be laid are their protection from damage by the traffic passing over them and from the influence of the changes in the temperature of the atmosphere.

In Canada and the greater portion of the United States the depth at which mains are laid is governed by the latter consideration, since the depth required for protection from frost is greater than that required for protection from the traffic carried on along the roadway above the pipes. The customary rule is to keep the top of the mains just below the normal frost line. In the vicinity of New York City this requires the mains to be laid with three feet of cover, while in Canada and the northern and northwestern parts of the United States, in which the winters are very severe, the depth may reach six feet.

In the Southern States, where the winters are mild, the changes in temperature are of minor importance and the mains need not be laid any deeper than is necessary to protect them from the traffic passing over them. For this purpose a depth of 24 inches is sufficient, except in business streets, where the traffic is apt to be heavy, in which case 2 feet 6 inches of cover should be given.

Temperature and Traffic Conditions

When the temperature and traffic conditions are such as to permit of the mains being laid comparatively near the surface, the character of the pavements, either already existing or which will probably be laid in the future, must be taken into consideration and the mains laid deep enough to obviate any danger of the service pipes being interfered with during the laying or repairing of the pavement.

Other pipe systems and subsoil structures also affect the problem at times, but, as stated in the question, these were to be left out of consideration for the purposes of this answer.

Nothing is gained by going below the depth determined as above, and the deeper the mains the greater is the expense incurred both in their installation and their maintenance. It is therefore advisable not to go any lower than is necessary.

Testing Tightness of Mains

When laying street mains, how would you test the tightness of the work before filling in the ditch and covering up the pipe?

Ans. When the piece of main being laid is an extension of an old main it is usually connected to the old main when the work is begun and the test for tightness is made with gas pressure. After such a length has been laid as to warrant going to work to fill in and close up the ditch, the open end of the pipe should be tightly plugged and the pressure allowed to come on the new pipe by removing the bag or stopper by which the gas has been shut off. Each joint should then be painted with soapsuds and examined for leaks, which will be indicated by bubbles at the points of leakage. Especial attention should be paid to the bottom of the joints. Any joints found to be leaking must be gone over and again tested. When all are tight the ditch can be filled in.

No Leaks Tested for in This Way

In testing in this way no attempt is made, as a rule, to test for leaks in the pipe between the joints, but if each length has been carefully hammered before it is lowered into the ditch there is only a slight chance of there being any such leaks. When the work is important enough to warrant the extra expense the new pipe can be left separate from the old and a temporary connection made through a meter.

(Thirty-ninth Installment Next Week)

THE DOHERTY THREE-PART RATE

(Continued from page 854)

Advantages of Rate

This rate, when applied, eliminates discriminations among customers and thus causes each customer to carry his share of the cost. Unreasonable demands or consumption on the part of one class of customers will not place a burden on the customers who are reasonable in their demands for service. It acts automatically in rewarding the customer for a good load factor.

It is the best rate to use under the competitive conditions in industrial business, because it reasons in the same figures that the customer does when considering investing in equipment to produce his own service. He is interested in the money required to put in his own plant—the demand charge. He is interested in the cost of keeping track of his production costs—the customer charge. He is interested in what the gas will cost per cubic foot—the consumption charge. Such competition is not so keen in the gas as the electric industry; however, such a rate properly worked out would make possible the putting on the lines of the gas company many heating possibilities which so far have been practically overlooked.

Such a rate eliminates a large number of rates for various classes of business which sometimes follows the expansion of a system to supply service to a varied class of customers.

Objections to Rate

The objection most often heard is that the customer does not understand the rate and it is too complicated to sell to the average person. Such objection is usually backed up by saying that it also increases the bills of the poorer customers.

A study of any city will show many of the small and minimum bill customers are among those most able to pay their proper share and that the poorer customer, whose wife does all her own work and does it on one range only, will be benefited.

Let us take as an illustration of this, two customers, Mrs. A. and Mrs. B.

Mrs. A. has a home with a range and large water heater. Her demand on the plant will be probably 150 cubic feet per hour.

Mrs. B. is not so well fixed and living in a more modest home, only has a range, consequently must heat her water and cook her meals and probably heat the water for laundry purposes on her range. Her demand on the plant will only be about 100 cubic feet per hour, but, doing so much work, she must use probably more gas than Mrs. A. and she must use it longer hours per day on account of her smaller demand. Mrs. B. requires less investment to take care of her service, which means a less demand charge, her customer charge is the same and her rate per cubic foot is the same. The cost of serving her is less and she profits by it.

Answering the Objection

The above objection is usually due to improper presentation of the subject. Where a choice of a straight meter rate, or three-part rate yielding the same average rate per thousand cubic feet are given to a community, I will venture the three-part rate will be selected if it has been properly explained.

The application of this rate in the natural gas fields of Kansas has saved for a number of years the gas supply to that country and it was sold to the cities and villages of that state against a heavy opposition where the rate was first proposed. Many of the old opponents are now strongly in favor of it.

One of the valuable features of the rate is that the fixed charge being a large part of the customer's bill keeps his expenses for gas more uniform and in case of extravagance or forgetfulness does not cause a wide fluctuation in his bill for which he has not planned in his family budget.

From the company's standpoint, and for the same reasons, the complaints on high bills will be reduced to a minimum, a factor of no small consequence in the consideration of public relations.

Just as it eliminates wide fluctuations in the customer's bill, it eliminates wide fluctuations in the gross earnings of the company, the fluctuation being only in amount reflected in the expense sheets of the company and producing a more uniform net earning figure throughout the twelve-month period.

Summary

The three-part rate

Collects revenue in proportion to the cost imposed by the customer.

Eliminates discrimination among customers.

Automatically rewards the customer for good load factor.

Is fair to the customer less able financially to pay.

Competes with other isolated industrial heating installations.

Opens a large field for expansion in industrial and domestic heating business.

Is easy to sell if properly presented.

Eliminates numerous rates for various classes of business.

Produces more satisfied customers by reducing high bill complaints.

Improves the company's financial condition by removing the valleys and peaks in the net earning statement.

THE FUEL OF THE FUTURE—WHAT SHALL IT BE?

(Continued from page 852)

that the advantages derived from the use of the low-priced soft coals are more than sufficient to counterbalance any disadvantages that may arise in the process.

It is estimated that one ton of good quality of coke or anthracite coal will yield on the average 52,500 cubic feet of water gas, or about 8,000 B.t.u. of heat per pound of coal. It may be assumed that the coke contains 10 per cent ash and has a heat content of 13,400 B.t.u. per pound, which means that the efficiency of the process averages around 60 per cent.

Properties of Water Gas

Water gas burns with a blue flame. This refers to the gas before it is enriched with petroleum hydrocarbons, or carburetted, as the process is called. Strictly speaking, the term water gas refers to the carburetted gas, and the uncarburetted gas is known simply as blue gas. It is called blue gas because it burns with a blue flame, which is the characteristic flame of burning carbon monoxide. The poisonous qualities of the gas are due to carbon monoxide that it contains.

When coke or anthracite coal is employed in the manufacture of water gas, it is very easy to clean the gas, as it does not contain much, if any, tar. This of course would not be the case when bituminous fuel was used for this purpose. The fact that the gas is so easily cleaned and, when put through the purification plant, contains but little tar and other impurities, makes its use very advantageous, and not only that, but its distribution is facilitated, particularly when the gas is distributed under high pressure.

Advantages of Gas

The freedom of the gas from tarry matters renders the gas suitable for operations of an industrial nature which are carried out in jet apparatus, where the flame is developed by the gas streaming out of a fine slot or opening. Tarry matters would clog the opening.

As it is estimated that one cubic foot of the gas will require two cubic feet of air for complete combustion, it follows that each cubic foot of the gas mixed with air, assuming that the original gas had a calorific power of 300 B.t.u. per cubic foot, possesses a heating value of 100 B.t.u. per cubic foot.

The use of blue water gas as an industrial fuel is recommended for the operations of annealing, hardening and tempering of steel and other alloys, for galvanizing, tinning, etc., as well as for high temperature work where regeneration is impracticable. One very common use for water gas is in the welding of steel tubing and tanks of large size.

Blue Water Gas the Ideal Industrial Fuel

In fact, blue water gas is the ideal industrial fuel. It possesses just the correct number of heat units per cubic foot to give a maximum flame temperature and best efficiency of combustion. It is a gas which is suited to almost every industrial operation, the only exception being made are those in which the product will be spoiled by the condensation of water. Water is produced by the buring of water gas and under certain conditions it might be possible that this water will be condensed during the manufacturing process. Of course, under ordinary conditions the temperature of the exit gases is so high that the water cannot condense. Accordingly, it may be possible to control the operations in such a manner that even if the product is one that will be injured by water, condensation of the water vapor in the gases of combustion is prevented by maintaining them at a high enough temperature at the outlet.

	Volumetric analysis.						Ratios.	
							CO / CO_2	CO / CO
Description.	H_2	CO	CH_4	CO_2	O_2	N_2		
Essen water gas from coke	54.52	31.86	1.64	12.00	..	..	...	..
Strong water gas	52.76	35.86	4.11	2.05	..	4.33	17.5	0.95
Average water gas	51.89	40.08	0.10	4.80	..	3.13	8.35	0.89
Water gas from anthracite	51.8	43.4	...	3.5	..	1.3	12.4	0.93
Water gas before carburetting, average	45.57	44.85	4.41	4.45	0.5	0.77	10.1	0.91
Water gas from anthracite	44.50	42.10	...	3.60	..	9.80	11.7	0.92
Water gas from bituminous coal	42.1	32.6	2.9	5.3	0.3	16.8	6.15	0.86

Carburetted Water Gas

One of the chief uses of water gas is in the making of a gas of higher calorific power which can then be added to coal gas and distributed to the gas customers at the legal calorific specification. Blue water gas is in this way mixed with the vapor products that are formed by the pyrolitic decomposition of gas oil. The higher hydrocarbons that are produced in this manner boost the thermal value of the gas, and likewise increase its cost.

It seems strange that such a condition should have existed in the gas industry for so many years. Car-

buretted water gas is not as efficient a gas as the blue gas. It does not burn as effectively and the combustion temperature, or, rather, the temperature of the products of combustion, is not as high as that of the straight blue gas. Nevertheless, expensive raw materials have been used to increase the thermal value of the gas and incidentally to increase its price as well, when just as good, if not better, results can be obtained with the lower B.t.u. gas. Conditions are, however, changing, and in a number of Western states permission has been given the gas company to make the cheapest gas and the best quality gas for the price, the gas that will give the best results in actual operation, not only in the industrial furnace, but in the domestic range and hot water heater as well.

Carburetted water gas may then be considered as a mixture of blue gas and oil gas, the latter being made by the cracking of gas oil. Briefly, the process of making this gas is to lead the blue gas, made in the usual manner, through a carburetter, which is filled with a hot checkerwork, while oil is permitted to flow down the same and decompose by coming in contact with the hot surfaces in the apparatus. The vapors become mixed with the blue gas and the mixture is then passed through a superheater for the purpose of fixing them in the form of true gases.

Composition and Properties of the Gas

The composition and the properties of the carburetted water gas depend, of course, on the percentage of oil that is used in the process and also on the manner in which the oil is cracked. The following analyses may be taken as typical of carburetted water gas:

Illuminants	10.7	12.9	12.82
Carbon monoxide	33.4	28.1	28.26
Hydrogen	38.1	21.8	37.20
Methane	7.6	30.7	18.88
Ethane	2.4	...	....
Carbon dioxide	3.3	3.8	0.14
Oxygen	0.7	0.5	....
Nitrogen	3.8	2.2	2.70

The thermal value of the first gas is 602 B.t.u. per cubic foot and that of the second gas 659.6 B.t.u. per cubic foot.

Mixed Gas

Mixed gas is obtained by mixing together water gas that has been carburetted and coal gas. Coke oven gas is also used in making the mixture. This is an attractive proposition, for it enables the by-product oven products to be utilized to good advantage. Thus the coke breeze that is formed during the operation of the oven can be used as a generator fuel in the manufacture of the water gas. This is also true of the retort gas plant, wherein coke breeze is also produced in appreciable amounts.

The process usually employed is a two-staged one, consisting of a carbonizing installation for the production of coal gas and a water gas set for the making of water gas. It is figured that one ton of bituminous coal will yield about 1,400 pounds of coke, six pounds of ammonia, 14 gallons of tar and about 11,000 cubic feet of gas, having a thermal value of approximately 570 B.t.u. This is true when a portion of the coke, about 350 pounds per ton, is used in the formation of producer gas for heating the coke ovens.

Then it may be estimated that from the 1,050 pounds of coke that remain there will be produced about 27,500 cubic feet of 300 B.t.u. water gas. The two gases can be made separately and then mixed in a holder to give a gas which has an average heat value of 375 B.t.u. per cubic foot.

Semi-Water Gas

Semi-water gas is a gas that is made in the generator by the combined action of air and steam. It is in reality a mixture of producer gas and water gas. The gas is interesting, for it can be made from rather low-grade fuels. In Germany and other countries where fuel is not so abundant and where low-grade fuels, such as lignite coal containing high percentage of moisture and considerable ash, are available in large quantities, the tendency has been to use these fuels in the producer to make a gas, which if it is not used directly in industrial processes, is at least consumed in heating the retorts of a chamber plant or of a gas works installation making coal gas.

It is not, however, possible to use these fuels in the manufacture of straight producer gas, as is common practice, for the operating difficulties are many that arise in the gasification of fuels that contain much water and considerable ash. One of the principal difficulties is the fusion of the ash, which is determined both by the temperature within the combustion zone of the generator and by the properties of the ash itself. The low-grade fuels contain mineral matters that react together to form fusible compounds.

The Addition of Steam

Hence it is necessary to add steam to the air that is blown in under the grate of the producer, with the result that the steam is decomposed by the hot incandescent carbon with the formation of carbon monoxide and hydrogen. Steam is also added in general producer gas practice, but not in such large amounts as when these low-grade fuels are employed. The decomposition of the steam is endothermic in character, with the result that heat is subtracted from the hot carbon and the temperature is reduced. The reduction in temperature thereby prevents the fusion of the ash.

The fact that low-grade coals of all sorts are available for use in the manufacture of semi-water gas forms one of the chief advantages of the process. It provides a useful outlet for these fuels, and from recent tests which were made in Germany, in which a very low-grade product was employed—a crude, earthy brown coal containing as high as 55 per cent of moisture—it may be concluded that any fuel, no matter how poor in quality it may be, can be used in the manufacture of this gas.

Composition and Properties of the Gas

The average composition of the gas can be seen from the following analysis:

Hydrogen .....from 11.60 to 19.75%
Carbon monoxide .....from 31.60 to 20.85%
Carbon dioxide .....from 2.35 to 9.25%
Methane .....from 3.00 to 3.45%
Nitrogen .....from 51.40 to 46.70%

This gas is not distributed, but is used in the plant at which it is produced. It is employed in furnace work, as, for example, in the production of steel in the open hearth furnace.

Coal Gas

Coal gas was the first artificial central-station gas made. This was the gas that Murdoch distilled in his crude retort for lighting his house. For a long time it was the only commercial gas made and used for heating and lighting purposes. It is the gas that is made by the distillation of coal in the absence of air in retorts which may be either of the vertical, horizontal or inclined type. The properties and the composition of the gas obtained are dependent on the nature of the coal employed, the temperature at which carbonization takes place and the size of the retort in which the process is carried out. The higher the temperature at which carbonization is carried out, the more the percentage of hydrogen in the gas and the less the percentage of methane and other higher hydrocarbone. The high temperature results in the decomposition of these gases with the liberation of hydrogen and the deposition of carbon. In general, about 17 to 20 pounds of coal of the ordinary sort are required to produce 1,000 cubic feet of gas at 15 degrees C.

As has been indicated, the composition of coal gas varies according to the conditions under which it is manufactured. The following tabulation gives a few analyses of typical coal gases:

	Volumetric Analysis								
	H	CH_4	CO	C_2H_4	C_2H_6	Heavy hydro-carbons	CO_2	O_2	N_2
Retort gas, 5.5 hours	67.12	22.58	6.12	...	...	1.79	1.50	..	0.89
Retort gas from cannel coal	60.0	20.0	10.00	...	...	0	...	..	10.00
Retort gas	54.9	30.1	7.7	...	...	3.3	1.4	0.2	2.4
Retort gas, 5-6.5 per cent 0 in coal	54.21	34.37	6.68	2.47	0.79	...	1.47	..	..
Retort gas, bituminous coal	53.79	36.11	3.40	...	...	3.26	0.27	0.14	3.03
Common coal gas	52.5	34.0	5.0	4.0	...	...	...	0.05	4.45
Coal gas, London	50.7	37.8	4.1	...	...	4.4	...	..	3.00
Retort gas, Paris	50.1	33.1	6.3	...	...	5.8	1.5	0.5	2.7
Retort gas, Berlin	49.7	32.7	9.5	...	...	4.6	2.5	..	1.0
Aberage retort gas	48.49	35.9	6.61	...	...	3.83	0.12	..	5.05
Retort gas, Boston	47.29	38.67	1.04	...	...	5.21	1.04	..	6.75
Retort gas, Cincinnati	45.85	39.26	0.82	...	...	5.17	0.82	..	8.08
Retort gas, Bonn.	39.7	43.1	4.7	...	...	4.7	3.0	..	4.7
Retort gas, cannel coal	36.44	44.28	3.39	...	...	7.9	1.7	0.19	6.1
Retort gas, Cleveland	34.8	28.8	0.2	...	...	11.2	0.2	..	24.8
Wigan cannel coal gas	16.0	58	12.3	...	...	12	...	..	1.7

Uses of Coal Gas

The uses of coal gas are many in the industrial field, for it is commonly employed as a heating medium, either alone or in combination with water gas, as mixed gas. Its use in the home for heating is also very common. In industry it is used for melting, annealing and reheating metals, for firing crucibles in which non-ferrous metals are melted and for many other uses in the metallurgical and other fields. The uses to which this gas is put are really too numerous for mention or discussion here. In later articles in the Fuel of the Future Series they will all be discussed in considerable detail.

Low Temperature Carbonization

A few words must be said regarding the production of gas by the low temperature distillation method. In this process of carbonization the coal is heated in the retorts to a lower temperature than is commonly employed and with results that are much different than what are obtained in the older process of carbonization. There have been many special developments in this field, but space is too limited to discuss these.

Due to the low temperature at which the process is carried out, there is a greater production of tar and the properties of the tarry deposits are quite different from those which are obtained in the ordinary carbonization process. The gas is obtained in smaller yield and of lower calorific power, and a semi-coke product is left behind in the retort after carbonization.

These are essentially the results of the avoidance of secondary decomposition of the initial products of distillation. The gas that is obtained by the low temperature process is from 60 to 80 per cent of the volume obtained by the high temperature process, and it is free from naphthalene. The tar is also free from this hydrocarbon. The tar is thin and light and in reality it resembles an oil more than a tar. In fact, the specific gravity of the tars is so nearly that of water that considerable difficulty is experienced in separating them from water by settling. Furthermore, there is no free carbon in the tar.

Use of the coke as an industrial fuel has been suggested and in certain cases this field has been exploited with success. This coke contains about 5 to

15 per cent of volatile matter. It is dense in structure and possesses good strength and has none of the fingering effect that is present in coke recovered from the high temperature carbonization process.

As far as the ammonia recovered is concerned, there does not appear to be much difference in the quantity as compared with the high temperature process.

Oil Gas

The use of oil for the production of gas has only limited application. In the manufacture of carburetted water gas, oil is cracked and the vapors are mixed with the blue gas. This may be considered as one type of an oil gas process. Another process, known as the Dayton process, is essentially an air-oil gas process. In this process partial combustion of certain constituents of the oils takes place within the retort or reaction chamber. Thus all the heat that is required for the thermal decomposition of the hydrocarbons is supplied internally. It is said that 88 per cent of the heat in the oil is obtained in usable form as tar or gas. One distinguishing characteristic of this process as compared with other methods of artificial gas manufacture is that in this case no external heat is applied.

The raw material that is employed in this process is a gas oil or fuel oil and the manufacture of the gas consisted in atomizing this oil in admixture with preheated air, the mixture being fed into reaction chambers where in the oil hydrocarbons are decomposed with the formation of gas. It is possible to control the operation so that a gas possessing a calorific power from 300 to 560 B.t.u. per cubic foot is obtained.

It is estimated that about four gallons of fuel or gas oil are required to make 1,000 cubic feet of a 450 B.t.u. gas. The composition of an oil gas may be seen in the following tabulation:

Carbon dioxide	6.1 per cent by volume
Unsaturated hydrocarbons	14.7 per cent
Oxygen	0.9 per cent
Carbon monoxide	5.6 per cent
Saturated hydrocarbons	7.8 per cent
Hydrogen	1.7 per cent
Nitrogen	63.2 per cent
Total sulphur	3 to 8 grains per 100 cu. ft.
Flame temp., theoretical	3700 degrees F.
Calorific power	450 B.t.u.

THE SALE OF COKE

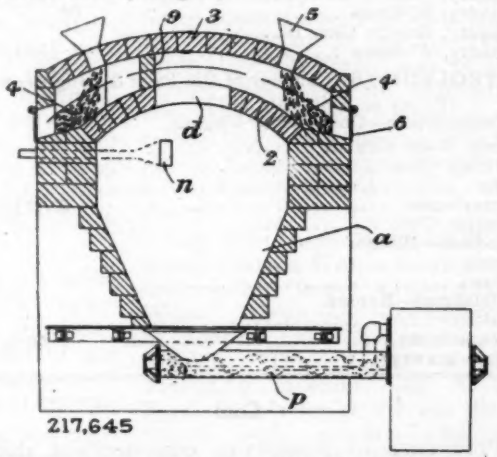
(Continued from page 860)

from the rest of you, so I have mine, too. After spending seven or eight years in the past directly in charge of coke sales for our company, I have come to the conclusion that the ideal way to sell coke is through your local dealers. I believe this can be worked out in the small plant especially, except possibly in some cases where the plant is not located on the railroad siding and it is necessary to have a truck to haul coal to the plant. In this case, of course, the truck can be used for delivering coke. At Albion, all of our coke is sold through the local coal dealers. We find this works out very satisfactorily, for several reasons. We have only three accounts on our books, thus eliminating a lot of bad accounts, and we also eliminate all other expenses such as advertising, maintenance of truck, labor, etc. We believe the expenses connected with the sale and delivery of coke will usually amount to more than the preferential that the dealer is allowed for selling it. I am not so sure but I stand alone on this idea, but it will take a lot of argument to convince us that this is not the cheaper way to dispose of our coke. It should be an easy matter to convince your local dealer that it is to his interest to sell gas coke. He has sense enough to know that every time you sell a ton of coke he is the loser.

In conclusion, let me say that we will never have any trouble in disposing of our coke, providing we keep the price where the consumer can afford to use it in comparison with other fuels.

GAS FROM POWDERED COAL

A generator "a" of conoidal form is provided with an arched roof 2 having an outlet "d" for the gas. Powdered fuel and primary air are fed into the generator through one or more tangential inlets "n," and the ash is discharged by a screw conveyor "p." The fuel may be peat, lignite, charcoal or coal, and the temperature in the generator is maintained at 900°—1,200° C. The carbon and volatile matter are converted into gas by the circulation of the pulverized material with air in the generator, and sufficient time is given to produce a gas rich in carbon monoxide and hydrogen.



217,645

The gas is purified by causing it to impinge on hot coke 4, which is fed from hoppers 5 through the outer roof 3 on to the inner roof. At one side of each coke bed a baffle extends between the two roofs, and another baffle 9 partly surrounds the opening "d" to deflect the gases to the exit. Another form of generator is described in which secondary air is admitted to the space above the roof to burn the gas.—(British Patent No. 217,645.)

Current Market Prices

COALS (By Courtesy of Coal Age)
A. Bituminous.

(Spot prices, F. O. B., mines, net tons).

High Volatile, Eastern	Market	Price
Pool 54-64 (Gas Standard)	New York	$1.40 to $1.65
Pittsburgh screened gas	Pittsburgh	2.30 to 2.50
Pittsburgh gas, mine run	Pittsburgh	2.00 to 2.25
Kanawha lump	Columbus	2.00 to 2.25
Kanawha mine run	Columbus	1.30 to 1.55
West Virginia lump	Cincinnati	2.15 to 2.50
W. Virginia gas mine run	Cincinnati	1.35 to 1.60
Midwest		
Indiana 4th vein lump	Chicago	2.75 to 3.00
Indiana 4th vein mine run	Chicago	2.25 to 2.50
South and Southwest		
Big Seam lump	Birmingham	3.00 to 3.25
Big Seam mine run	Birmingham	1.50 to 2.00
Southeast Kentucky lump	Louisville	2.50 to 2.75
Southeast Kentucky mine run	Louisville	1.25 to 1.75

B. Anthracite.

(Spot prices F. O. B. mines, gross tons),

Market	Freight rates	Independent	Company
Egg New York	$2.34	$8.50 to $9.40	$8.75 to $9.25
Egg Philadelphia	2.39	9.00 to 9.70	8.80 to 9.25
Egg Chicago (net tons)	5.06	8.17 to 8.27	8.14 to 8.20

COKE (By Courtesy of Iron Trade Review).

Connellsville, furnace	$3.00 to $3.25
Wise County, furnace	3.75 to 4.50
Alabama, furnace	4.50 to 5.00
Foundry, Newark, N. J., del	10.41
Foundry, Chicago, ovens	10.75
Foundry, Boston, delivered	11.50
Foundry, St. Louis	11.00
Foundry, Granite City, Ill	9.00
Foundry, Alabama	5.00 to 5.25

PETROLEUM (By Courtesy of Oil, Paint & Drug Reporter)

(Prices at wells, per bbl.)

Pennsylvania—Ohio—West Virginia.	
Cabell, West Virginia	1.45
Corning, Ohio	1.65
Lima	1.83
Pennsylvania	$2.75 to 2.85
Wooster, Ohio	1.65
Indiana—Illinois.	
Illinois	1.62
Indiana	1.63
Oklahoma—Kansas.	
Healdton	.90
Mid-continent (low gravity)	.90 to 1.05
Gulf Coast.	
Gulf Coast, Grade A	$1.35
Gulf Coast, Grade B	1.15

GAS OILS.

Gas Oil, Bayonne, bulk gal	5¼ to 5½c
Gas Oil (32-36) Oklahoma, gal.	2⅞ to 3c
Gas Oil (32-36) Gulf Coast, gal	3½ to 4

PIPE AND FITTINGS—CAST IRON GAS PIPE.

(By Courtesy Iron Trade Review.)

Four-inch, Chicago	$61.20 to $62.20
Six-inch and over, Chicago	57.20 to 59.20
Four-inch, Birmingham	56.00 to 59.00
Six-inch and over, Birmingham	52.00 to 53.00
Four-inch, New York	69.60 to 71.60
Six-inch and over, New York	64.60 to 65.60
Standard fittings, Birmingham, base	115.00

6 to 24-inch, base; over 24-inch, plus $20; 4-inch, plus $20; 3-inch, plus $20.

BY-PRODUCTS

(By Courtesy of Oil, Paint and Drug

Ammonia aqua, 16 deg. drums lb	5 to 5¼c
Ammonia aqua, 20 deg. drums lb	6¼ to 6½c
Ammonia aqua, 26 deg. drums lb	6½ to 7 c
Ammonia squa, anhydrous cylinder, lb	30 to 36 c
Ammonium sulphate, bulk F. O. B. Works, per 100 lbs	$2.60 to $2.65
Potash prussiate, yellow casks, lb	17 to 17½c
Potash prussiate, red casks, lb	37 to 38 c
Soda prussiate, yellow casks,	9½ to 10 c
Soda sulphocyanide, barrels, lb	45 to 55 c

COAL TAR BASIC PRODUCTS.

(By Courtesy of Oil, Paint and Drug Reporter)

Benzol C. P. tanks, works, gal.	24 to 25c
Benzol, drums, gal	30c
Benzol, 90% tanks, works, gal.	23c
Benzol, 90% drums, gal	28c
Napthalene, flake, barrels, lb	4½ to 5 c
Napthalene, dyestuff bags, lb	4½ to 5 c
Solvent Naphtha, water white works, gal.	24 to 25c
Solvent Naphtha, drums, works, gal	29 to 30c
Toluene, C. P. tanks, works, gal.	31c
Toluene C. P. drums, works, gal	36c

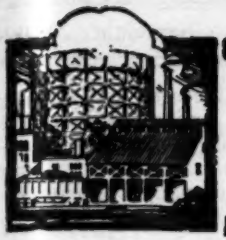
Coal

Production of bituminous coal declined sharply during the week ended September 6, when, according to the Geological Survey, 7,941,000 net tons were produced, a falling off of 778,000 tons from the week ended August 30, when 8,719,000 tons was the yield, according to revised figures. Anthracite output likewise receded, 1,451,000 net tons having been produced, compared with 1,837,000 tons during the previous week.

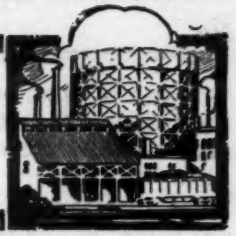
Increasing strength continues to pervade the anthracite market, orders steadily gaining in volume, though actual business is by no means keeping pace with inquiries. Prices are holding firmly.

Gas Oil

Demand was active, gas oil being called for. Gas oil held at a range of 5¼c to 5½c per gallon, f.o.b. Bayonne. Gas oil, while not as strong as the fuel oil market, was showing more strength at refinery points, with sellers endeavoring to work the market up.



NEWS OF THE GAS INDUSTRY



Michigan Gas Men Meet

Many interesting papers read at 32nd annual convention

The annual meeting of the Michigan Gas Association was held on Wednesday and Thursday, September 10 and 11, 1924, in the Hotel Statler, Detroit, Michigan. A goodly proportion of the 275 members of the association attended the meetings.

George H. Waring, the president of the association, called the meeting to order and delivered an address, which has been printed in full in the September 13th issue of the American Gas Journal.

Professor White, of Ann Arbor, made a report on the industrial fellowship at the University of Michigan, which has been sustained now for twenty-four years by the Michigan Gas Association. This is the oldest industrial fellowship in the United States. The work, now being done, is on the carbonization of coal, particularly to determine the exact length of time consumed in the distillation of coal.

Use of Oxygen in Gas Producers

A paper was read by Professor White on the use of oxygen in gas producers. The work was done in a small experimental laboratory device and the main purpose was to determine if it was possible in this manner of working the producer to control the temperature in the hot zone by the use of steam. It was found that by the use of steam the temperature in the lower part of the producer could be controlled. It was also found from experimentation that the trouble in the producer will be in the top of the machine. The suggestion was also made that fusion of the ash would have to be resorted to in order to operate the producer with oxygen under practical conditions.

Major Forward, secretary-treasurer of the American Gas Association, delivered a few remarks in the way of greeting from the national association. Major Forward said that all the exhibition space on the Steel Pier at Atlantic City has been sold for the coming annual convention of the American Gas Association and that all signs point to a very successful convention.

Vertical Retort Gas Making

The reading of a very interesting paper by M. H. Frank, manager Wisconsin Power and Light Co., Fond du Lac, Wisconsin, on the results of five years' operation of a vertical retort gas plant concluded the forenoon meeting on Wednesday. It was pointed out that very good results have been obtained from this installation. Naphthalene trouble has been entirely eliminated. Labor costs are less and the quality and quantity of residuals recovered, especially coke and tar, are much better than in other retort plants.

A discussion followed the delivery of this paper, which discussion was particularly concluded with the matter of yields of gas and residuals obtained in the manufacture of gas in vertical retorts.

The afternoon meeting was commenced with the reading of a paper entitled "Electrical Precipitation of Tar," by Charles F. Morris of Denver, Colorado. Before the reading of this paper a preliminary explanatory paper describing the principles of the electrical precipitation, or Cottrell process. It was pointed out that the precipitation required practically no trouble. The electrical apparatus does not need special attention.

It was brought out in the discussion that an installation has been operating in Philadelphia, removing from 95 to 97 per cent of the tar in the gas.

The next paper delivered was entitled "Locating and Reducing Excessive Use of Boiler Fuel in Small Gas Plants," by C. L. C. Kahn. This paper dealt with the various factors that control the operation of boiler plants in small gas plants. It gave some definite details regarding gaining proper efficiency in boiler plant operation.

In the discussion it was brought out that one of the principal points to be emphasized in this connection is the saving of all heat in the boiler plant, in the machines in which steam is used, so that the temperature of boiler feed-water should be as high as possible. Attention was also called to the common fallacious idea that the making of gas analysis by means of the Orsat apparatus is a difficult matter. This is not so and the apparatus should be freely used in analyzing flue gases to determine whether complete combustion is taking place. Air leakage should also be looked for, as it is particularly destructive of boiler efficiency.

The next paper was read by Henry Fink on "Labor Saving Machinery for Street Construction Work." This paper was followed by another on a similar subject, entitled "The Barber Greene Trenching Machine," by A. G. Ford. The latter article was illustrated with moving pictures. There was also a moving picture on bronze welded joints.

Banquet of Combined Associations

On Wednesday evening a combined banquet of the Michigan Gas Association and Michigan Electric Light Association took place. The speaker of the evening was Dr. M.

S. Rice. A large number of gas and electric men, their ladies and guests, were present at the banquet.

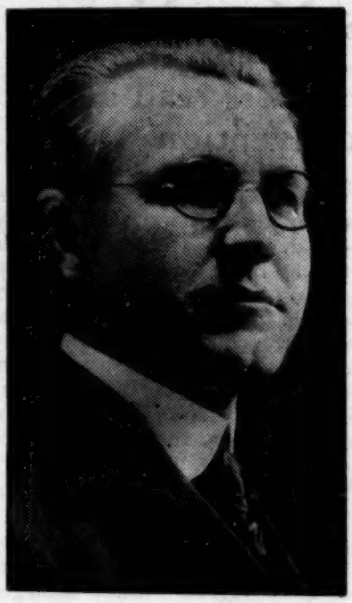
The Thursday morning meeting was opened by Chester Grey, vice-president, in the absence of the president, Mr. Waring. The first paper read at the meeting was written by George R. Horning on "One Season's Experience in House Heating with Gas at Salt Lake City."

This paper described the experience gained in Salt Lake City in house heating, the gas being sold on the three-part rate. Various systems of house heating were described and the advisability of conversion of existing furnaces was discussed. It was brought out in this paper that the only practical rate on which to take on house heating business is the three-part rate. The desirability of house heating load for the gas company was discussed in detail. In selling gas for house heating the customer was actually allowed to sell himself, and his attention should be called to the fact that his gas bill will be high when he uses gas as a house heating fuel. In selling house heating installations, thermostatic control must be insisted upon. In fact, it is better not to sell the customer on gas house heating at all, unless he consents to the extra expense of installing thermostatic control devices. The paper also contained a number of hints regarding anticipation of trouble in house heating installation. The question of chimney draft and chimney condensation was also gone into in considerable detail.

The next paper was read by D. E. Byerly on the "Doherty Three-Part Gas Rate." This paper was an excellent exposition of the principles underlying the three-part rate and of its workings and ramifications.

In the discussion it was brought out that it is very difficult to explain the reasons for the rate to the average gas customer. It was also pointed out that there is great inertia among the gas companies themselves toward changing the gas rate from the old flat rate to the scientific three-part rate.

The final paper was read by F. E. Caton on "Coke Sales from the Standpoint of the Small Properties." There was considerable discussion of this paper, particularly along the suggestion of selling the coke through the local fuel dealer.



Chester Grey

Manager and Secretary of the Lansing Fuel and Gas Co., New President of the Michigan Gas Association

The meeting closed with the report of the nominating committee on nominations. The following were nominated and elected: President, Chester Grey, of Lansing, Michigan; vice-president, Byron G. Campbell, Pontiac; secretary, A. G. Schroeder, Grand Rapids.

Steel Treaters to Feature Industrial Gas

Representatives of the steel industry in all the leading manufacturing countries of the world will attend the International Steel Exposition on the Commonwealth Pier in Boston this month, which is to be one of the features of the annual convention of the American Society for Steel Treating, to be held in that city September 22-26.

The manufactured gas industry will play an important part, both in the exposition and in the convention itself, and the steel men will be given many opportunities to see and examine the latest developments in the art of steel treating by gas, a function of the industry which is growing by leaps and bounds.

The American Gas Association, with the co-operation of the industrial gas engineers of New England, will be among the leading exhibitors at the exposition, as will a number of leading gas appliance manufacturers, most of whom are members of the association. So important is this feature that the Boston Consolidated Gas Company has run a pipe line for two miles in order to get sufficient capacity to the building to take care of the various exhibits showing the use of gas for industrial purposes.

The booths of the American Gas Association will be in charge of Mr. A. Gordon King, service engineer from A. G. A. headquarters in New York. Other exhibits of special interest to gas men will be the booths of the Combustion Utilities Corporation, Surface Combustion Company, the American Gas Furnace Company, A. H. Wolff Gas Radiator Company, Boston Consolidated Gas Company, Armstrong Cork and Insulation Company, Republic Flow Meters Company, the Bristol Company, Industrial Gas Equipment Company, Bellevue Industrial Furnace Company, New England Association of Gas Engineers, and the W. S. Rockwell Co.

During the convention Mr. H. O. Loebell, of the Combustion Utilities Corporation, will read a paper on "Improving Quality Standards and Lowering Production Costs of Heat Treated Steel." Mr. J. A. Doyle, of W. S. Rockwell Company, will speak on "The Selection of Fuel for the Heat Treatment of Metal."

C. J. Hauschildt, Gas Engineer, Expires Suddenly

Carl J. Hauschildt, gas engineer for the Peoples Light Company, died suddenly last week.

While the deceased was in ill health for the past year, he was

not confined to his home, and the report of his sudden death came as a shock to hundreds of friends and acquaintances. Mr. Hauschildt was very highly regarded by the employees of the Peoples Light Company and was well known among technical men throughout this part of the West for his work as a gas engineer.

Born in Davenport, January 14, 1881, Mr. Hauschildt had lived all his life here. He was educated in the schools of Davenport and entered the employ of the Peoples Light Company at the age of 14. Through hard work and much study he became an expert on the company's staff and was finally made engineer of the gas department.

NEW GAS APPLIANCE COMPANY FORMED

Old Friends and Associates in the Gas Business Reunited—Sounds Like a Page from Pilgrim's Progress

Back in 1898, J. P. Conroy, of the J. P. Conroy Sales Co., 44 Murray street, New York, was commercial manager of the Battle Creek Gas Company, Battle Creek, Michigan. Mr. A. L. Zwisler was commercial manager for the Kalamazoo Gas Company of Kalamazoo, Michigan.

Jim and Art, as they are familiarly known to their friends in the trade, were then closely associated and a friendly rivalry existed to see which one could sell the greatest number of gas ranges and other gas appliances.

In 1901 the General Gas Light Company of Kalamazoo was organized and Mr. Zwisler and Mr. Conroy joined the company as the two sole representatives, Mr. Zwisler going West and Mr. Conroy coming East, and to these two is due the original introduction of the Humphrey arc lamp to the gas trade throughout the country.

Later Mr. Zwisler was made general sales manager of the General Gas Light Company of Kalamazoo and Mr. Conroy was sent to New York to open up a New York office.

In 1907 Mr. Zwisler organized his own company, known as the American Gas Arc Lamp Company, for the manufacture of gas arc lamps, and Mr. Conroy continued with the original company until 1920, when he resigned his position to organize his own sales company in New York City.

Realizing that there was a great demand for a very simple, practical and efficient low-priced radiant gas heater, Art and Jim undertook the designing and perfecting of such a heater, with the result that they have produced a very simple and practical radiant gas heater, known as Radex, and have organized a company in Kalamazoo, known as the Radex Gas Heater Company,

Radex Gas Heater

for the manufacture of this heater.

We are advised that this company is already in production and are in a position to manufacture several hundred heaters a day. The construction of this new heater is something entirely new. It is an 8 radiant heater built all in one cylinder column, with an inner and outer radiant heating element and a continuous circular flame chamber between the inner and outer cones with a circular burner, so that when the heater is lighted up the whole column glows red hot, giving out an abundance of radiant heat energy in almost every direction of the room.

Because the radiant column stands out alone it enables air to circulate around all sides of this column, allowing plenty of secondary air, assuring perfect combustion and overcomes entirely any possibility of odor. The burner, being of a cylinder type, secondary air is passed up around the burner both on the inside and outside. It is claimed there is no loss of heat by conduction, as nearly all the heat from the gas must leave the radiant column by radiant heat energy.

A. S. HUEY DIES

Headed H. M. Byllesby & Co., Which He Formed in 1892

Chicago, Ill.—Arthur S. Huey, chairman of H. M. Byllesby & Co., of New York and Chicago, died here at the South Shore Country Club, where he made his home.

Mr. Huey was also chairman of the Standard Gas and Electric Company and the Northern States Power Company and an officer of eleven other companies, mostly in the field of public utilities ownership or operation. He became interested in electricity when a young man, and after serving a technical apprenticeship in the shops of the United Edison Company, of Minneapolis; the Thomson-Houston Company and the Northwestern General Electric Company, he formed, in 1892, a partnership with the late H. M. Byllesby and became vice-president of the company. With Mr. Byllesby he built up the string of public utilities operated by the firm in more than a hundred cities.

Mr. Huey was born in Minneapolis in 1862 and was educated in the public schools there. Several years ago he married Miss Hattie King. He was a member of the Union League and Mid-Day clubs of Chicago and the Railway and Lawyers' clubs of New York, and the National Electric Light Association, of which he was formerly vice-president.

New Directors for Gas Firm

Kansas City, Kan.—The first move of Henry L. Doherty & Co. since taking over the Wyandotte County Gas Company and the Kansas City Gas Company has been made in calling a directors' meeting of the Wyandotte company.

Four vacancies on the directorate were filled temporarily by Doherty men. The new directors,

all connected with the Doherty interests at St. Joseph, are Charles H. Mayer, S. B. Irelan, Harry Warner and Frank Harrington. They will serve until local directors can be named to take their places.

Three other officials, also of the Doherty interests, were named. All live in New York and will remain there, merely carrying the titles for official convenience. They are T. J. Carter, vice-president for the Doherty company for numerous subsidiaries; Thomas Wallace, assistant treasurer, and T. E. McWhiney, assistant secretary.

Management of the Wyandotte company will remain the same, the New York representatives said.

W. P. Strohbar, industrial agent for Henry L. Doherty, said the company would follow its usual policy of keeping the management and operation of the company in the hands of local men. He said the same service would be maintained. The meeting was at the company offices in the Brotherhood building.

Gas Company to Spend $328,000 for Buildings

Fort Wayne, Ind.—A total of $328,000 worth of construction work will be launched soon by the Northern Indiana Gas and Electric Company at the new plant just south of Hale avenue and west of Reidmiller avenue. Building permits have been issued by the city building inspector. Pieces of construction work are as follows: Two gas holders at a cost of $184,000; a by-products building, $33,600; a screening station, $24,500; a quenching station, $4,100; a generator building, $35,000; a boiler and produce house, $45,700, and a truck scalehouse, $520.

Interstate Public Service Co. Files Gas Schedule

Newcastle, Pa.—The Interstate Public Service Company has filed a schedule of rates with the Public Service Commission for artificial gas in Newcastle, effective November 1, when the contract for natural gas expires.

The schedule is as follows:

First 5,000 cu. ft., $1.40 per M. cu. ft.

Next 10,000 cu. ft., $1.35 per M. cu. ft.

Next 15,000 cu. ft., $1.30 per M. cu. ft.

Next 20,000 cu. ft., $1.25 per M. cu. ft.

Excess of 50,000 cu. ft. per mo., $1.20 per M. cu. ft.

A minimum monthly charge of $1 is to be made and the bills will be due and payable ten days after date and if not paid within the ten days a penalty of 10 per cent of the total charge will be added.

The schedule of rates for artificial gas follows that agreed upon prior to the construction of the new plant. At a conference of city officials, directors of the Chamber of Commerce and officials of the Interstate, it was agreed the maximum rate would not exceed $1.40.

The Interstate has made all preliminary arrangements for the changing from natural to artificial gas on November 1. The new plant is being completed at a cost in excess of $350,000.

"Some adjustments in consumer's equipment may be necessary as a result of the change from artificial to natural gas and the company will have on hand a sufficient number of persons to make these changes promptly," said a statement by E. Van Arsdel, vice-president of the Interstate company. "It is the hope of the company that although the rates for artificial gas are necessarily higher than the rates heretofore paid for natural gas, the company's customers will find the new gas more desirable, even at the higher price, because of the assurance of an adequate supply. The company is extremely anxious to please its patrons and wants in every possible measure to co-operate with them in making the operation of the new plant a thorough-going success from every point of view."

The company gives positive assurance that every modern device available in the manufacturing of artificial gas has been installed by the company and the rate for Newcastle is one of the lowest in the country, considering the class of the city.

Contracts Awarded

The Northern Westchester Lighting Company is making extensions and improvements to its plant at Ossining, N. Y. Among these improvements will be the installation of a seven-foot cone top water gas apparatus, for which the contract has been given to the U. G. I. Contracting Company of Philadelphia.

This apparatus will be equipped for complete hydraulic operation.

The Gas Machinery Company of Cleveland, Ohio, is under contract to install benches with silica retorts and settings in the gas plants at Ithaca, N. Y., and Canandaigua, N. Y.

The bench work at Ithaca is to be provided with stop end silica retorts, and the bench work at Canandaigua is to be provided with through retorts.

The Public Service Company of Northern Illinois has placed contract with the Gas Machinery Company of Cleveland, Ohio, for a new ten-foot carburetted water gas apparatus, to be erected in the gas works at Blue Island, Illinois.

The water gas set will be installed in a new building and will valve, air and steam meters, hand be complete with explosion check hydraulic operating equipment, overhead brick operating floor and auxiliary equipment.

Yearly Report of American Public Utilities Company

The American Public Utilities Company, with properties in Utah, Idaho, Indiana and Michigan, in its report for the year ended June 30, shows a decrease of about $2,400,000 in gross earnings, compared with the previous year, due to the sale of the Wisconsin, Minnesota and Mississippi properties. Net income was reduced more than $400,000, while surplus, after the payment of dividends, fixed charges and depreciation of parent and subsidiary companies, increased from $330,000 to $673,000.